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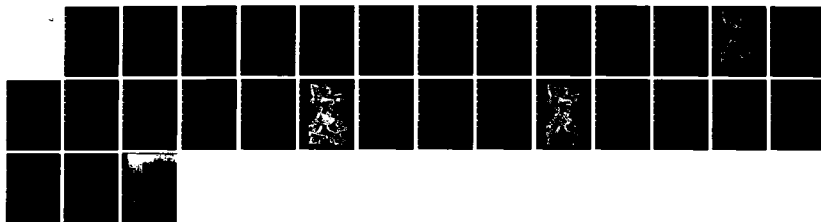
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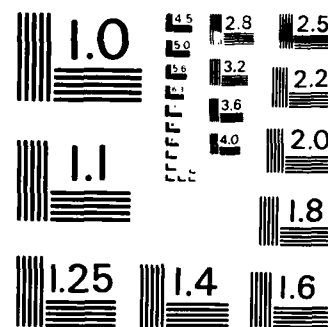
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DETERMINATION OF PRESENCE AND HABITAT SUITABILITY
FOR THE
INDIANA BAT (MYOTIS SODALIS) AND GRAY BAT (MYOTIS GRISESCENS)
FOR PORTIONS OF THE LOWER 6.6 MILES OF MCKEE CREEK, MCGEE CREEK
DRAINAGE AND LEVEE DISTRICT
PIKE COUNTY, ILLINOIS

AD-A141 937

FINAL REPORT

Submitted to
SAINT LOUIS DISTRICT, U. S. ARMY CORPS OF ENGINEERS

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James E. Gardner
Treva L. Gardner

August 1, 1980

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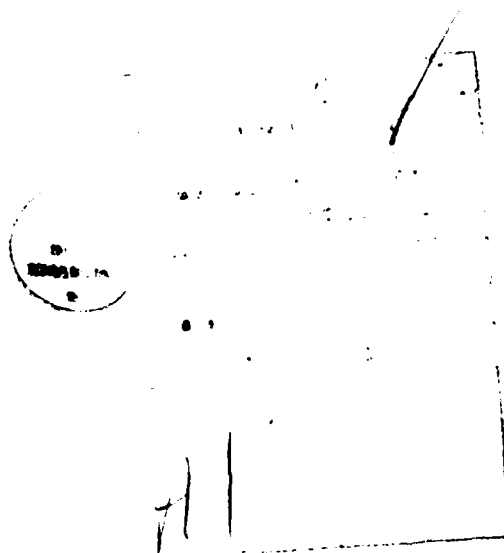
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the study area. A number of data were collected in determining habitat suitability, such as characterization of riparian habitat, description of the stream and data generated from live trapping bats. It is not the intention or duty of this report to comment on the possible effects on the local bat fauna by altering the course of McKee Creek. Bat fauna will be discussed in relation to all species captured, however, major emphasis will be placed on the endangered species, Myotis sodalis, captured during this study.

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INTRODUCTION

Two species of Myotine bats, both which occur in Illinois, are listed on the Federal Endangered Species List. The existence of Myotis sodalis, the Indiana bat (listed in 1973) and Myotis grisescens, the gray bat (listed in 1976) is threatened by human land-use associations. Although very little information on summer habitat requirements is known for Myotis sodalis, floodplains and their associated riparian vegetation is considered the most valuable land in the range of the Indiana bat (Humphrey et. al., 1977). Summer habitat meeting the survival requirements of Myotis sodalis was found along portions of McKee Creek, McGee Creek Drainage and Levee District, Pike County, Illinois.

Although both sexes of Myotis sodalis spend the winter hibernating in caves, summer nursery colonies have been found beneath the bark of dead trees in wooded riparian habitat (Cope et. al., 1978; Humphrey et. al., 1977; Cope and Humphrey, 1977). According to LaVal et. al. (1980), eleven hibernacula in Missouri contain about 350,000 Myotis sodalis, accounting for about 67% of all known Indiana bats. Upon leaving the caves in spring, the Indiana bats migrate to summer habitat. Migration due north from the largest and closest hibernacula in Missouri to Pike County, involves an airline distance of approximately 241 km (150 miles). Homing distances of over 200 miles is not uncommon for Myotis sodalis (Barber and Davis, 1969). LaVal et. al. (1980) reported a pregnant female flew 463 km northwest to Marion County, Iowa. Foraging adult and immature Myotis sodalis were captured in Union County, Illinois, in extreme southern portion of the state (Brack, 1979), indicating additional movements east and southeast into Illinois from Missouri.

Myotis grisescens spends both the winter and summer in caves. Gray bats establish nursery colonies in suitable Missouri caves in early April and forage near the caves over Ozark streams. Myotis grisescens summer foraging habitat has been found to include dense forested hillsides and ridgetops, as well as over calm pools of streams and adjacent riparian vegetation (LaVal et. al., 1977). By late September, gray bats have begun to establish hibernacula in caves. Although two gray bat transient sites were reported in two small caves in extreme southeastern Pike County, Illinois (Illinois Department of Conservation, Natural Areas Inventory Section), it is unlikely that they remain in the virtually non-cave portion of Pike County for the summer. Myotis grisescens summer nursery caves have been found in Ralls and Pike

counties near the Mississippi River in Missouri. These caves represent an airline distance of approximately 50 km from eastern Pike County, Illinois.

The purpose of this study was to determine the presence and habitat suitability for the two abovefore mentioned endangered species of bats, for portions of the lower 6.6 miles (10.6 km) of McKee Creek, McGee Creek Drainage and Levee District, Pike County, Illinois. Three channel cutoffs are scheduled to be constructed to straighten McKee Creek before it's destination into the Illinois River, in an effort to provide better drainage in the surrounding heavily agriculturalized area. This study involves mist netting for bats inside each of the proposed cutoffs, between each cutoff and collecting localities immediately upstream and immediately downstream of the study area. A number of data were collected in determining habitat suitability, such as characterization of riparian habitat, description of the stream and data generated from live trapping bats. It is not the intention or duty of this report to comment on the possible effects on the local bat fauna by altering the course of McKee Creek. Bat fauna will be discussed in relation to all species captured, however, major emphasis will be placed on the endangered species, Myotis sodalis, captured during this study.

This study was funded by the Saint Louis U. S. Army Engineer District under contract number DACW43-80-M-2247. This work was conducted under U. S. Fish and Wildlife Service Endangered Species Permit No. PRT 2-4857 and Illinois Department of Conservation Scientific Collector's Permit No. C0211.

MATERIALS AND METHODS

Description of the Study Area

McKee Creek is located in extreme northeastern Pike County in west-central Illinois, about 88.5 km west of Springfield. The lower 10.6 km of the McKee Creek study area begins at the highway 104 bridge at Chambersburg and extends just beyond the last cutoff segment, 2.8 km upstream from where the creek enters the Illinois River (Figure 1). The approximate 68 km long course of McKee Creek flows southeast. It begins in east-central Adams County and continues through southern Brown County before it's confluence with the Illinois River in northeastern Pike County. Tributaries of McKee Creek are primarily small headwater watershed streams with only a few small lateral drainage ditches from surrounding croplands

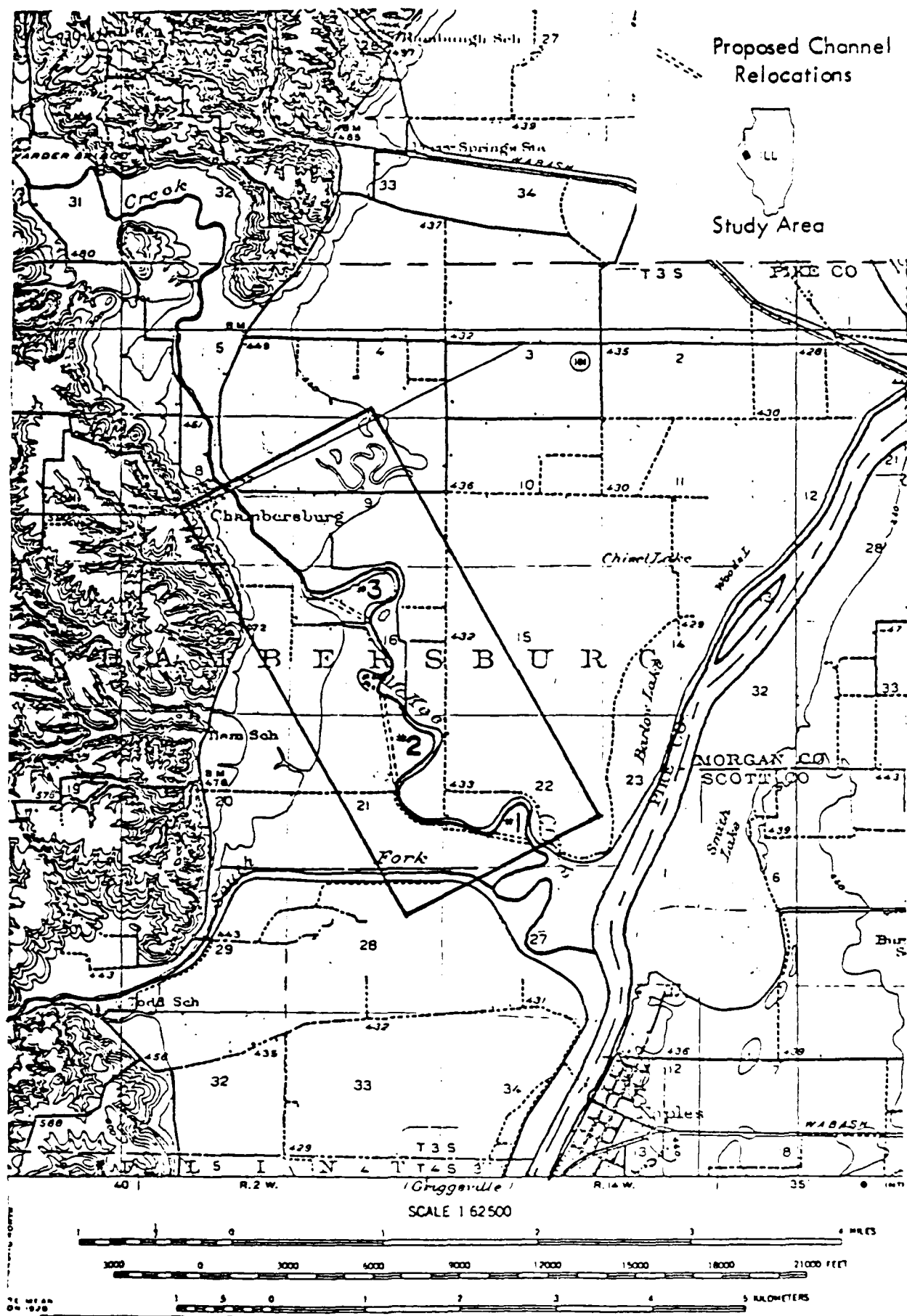


Figure 1. McKee Creek study area, McKee Creek Drainage and Levee District, Pike County, Illinois.

adding to it's flow in the project area. The nearest known caves to the study area are found over 40 km away, near Pearl, in extreme southeastern Pike County. The Illinois River floodplain surrounding both sides of McKee Creek is used extensively for agriculture, as evident by the orthophotoquadrangle (Figure 2). Presently, 90% of the area on both sides of the creek is cropland, 25% corn, 23% soybeans, 16% wheat and 26% hay and pasturelands or other uses. The remaining 10% represents riparian forest strip vegetation (Harry Wright, personal communications, University of Illinois Cooperative Extension Service Office, Pittsfield, Illinois). The riparian forest strips along the creek are dominated by silver maple (Acer saccharinum), cottonwood (Populus deltoides), black willow (Salix nigra), sycamore (Platanus occidentalis), box elder (Acer negundo) and various oaks (Quercus sp.). Other less dominant species include hackberry (Celtis occidentalis), slippery elm (Ulmus rubra), red mulberry (Morus rubra), sassafras (Sassafras albidum) and green ash (Fraxinus pennsylvanica). In several sections of the creek, a few trees lean over the water to form partial canopies. In some areas, trees opposite each other lean over the water creating a natural tunnel effect.

McKee Creek is a slow flowing stream in normal stage. It is characterized by long pools and intermittent ripples in the upper section of the study area and almost continuous pools in the lower sections. The width varies from 9 to 16 m and the average depth is less than 1 m. The stream substrate is primarily mud, however, small pockets of sand and very coarse gravel can be found in riffle areas of the upper sections.

Live Trapping Bats

Live trapping of bats was accomplished by using Japanese mist nets placed over the creek, perpendicular to the banks. The mist nets were 38 mm mesh (1 1/2 inch) and 2.2 m high, but were of variable lengths. Nets were positioned over the stream by using two 7.7 m high interconnecting steel poles. On such high net sets, three mist nets were stacked one on top of the other and suspended between the two poles by a rope and pulley system attached to each pole. The nets could be raised to a height of 6.4 m and lowered easily to retrieve bats captured in top sections of the nets. When possible, areas of the stream were chosen where the trees created a natural canopy. The nets were placed usually upstream behind the canopy to create a closed area between the stream banks and tree canopy. The verticle area covered



Figure 2. Orthophotoquad of McKee Creek, Illinois, illustrating the surrounding croplands and riparian forest strip.

by mist nets ranged from 121.4 square m (18.4 X 6.6 m) to 83.1 square m (12.9 X 6.6 m). Nets were placed in the capture position at sundown and checked at intervals of 15 minutes until after midnight. Mist netting was accomplished in eight different sites during eight nights of clear weather (Table 1). Mist nets were placed in each proposed cutoff segment (3sites); between each cutoff (2 sites); and immediately upstream (2sites) and immediately downstream (1 site) of the project area. Netting sites will hereafter be referred to by capital letters (Figure 3).

Table 1. Location and netting date of bat trapping on McKee Creek, Pike County, Illinois.

Net Site	Date	Location
A	5 June, 1980	T3S, R2W, Sec. 22; NE-SW-SW-SE
B	18 July, 1980	T3S, R2W, Sec. 22; NW-SE-NE-SW
C	16 July, 1980	T3S, R2W, Sec. 22; SW-SW-NW-SW
D	15 July, 1980	T3S, R2W, Sec. 21; SW-NE-NE-NE
E	4 June, 1980	T3S, R2W, Sec. 16; SW-SW-SW-NE
F	3 June, 1980	T3S, R2W, Sec. 16; NE-NE-NE-NW
G	17 July, 1980	T3S, R2W, Sec. 16; NW-SW-NW-NW
H	14 July, 1980	T3S, R2W, Sec. 8; NE-NW-NW-SE

Data recorded for each bat captured included: species, sex, age and reproductive condition. Reproductive conditions of males were determined by size and position of the epididymides. Scrotal bats were characterized by enlarged or swollen epididymides in pigmented sheaths dorsolateral to the tail. Male bats were classified as reproductively active by examination of an erected penis. Female bats were diagnosed as lactating or post-lactating on the basis of teat examination. Assignment of bats into age classes was determined by closure of the phalangeal epiphyses. Bats were designated as immature by their small overall size and incomplete ossification of the epiphysis. All other bats were classified as adults. Other data recorded for each bat captured included the flight direction and height at which bats hit the net. All bats captured and examined were immediately released unharmed at site of capture that same night.

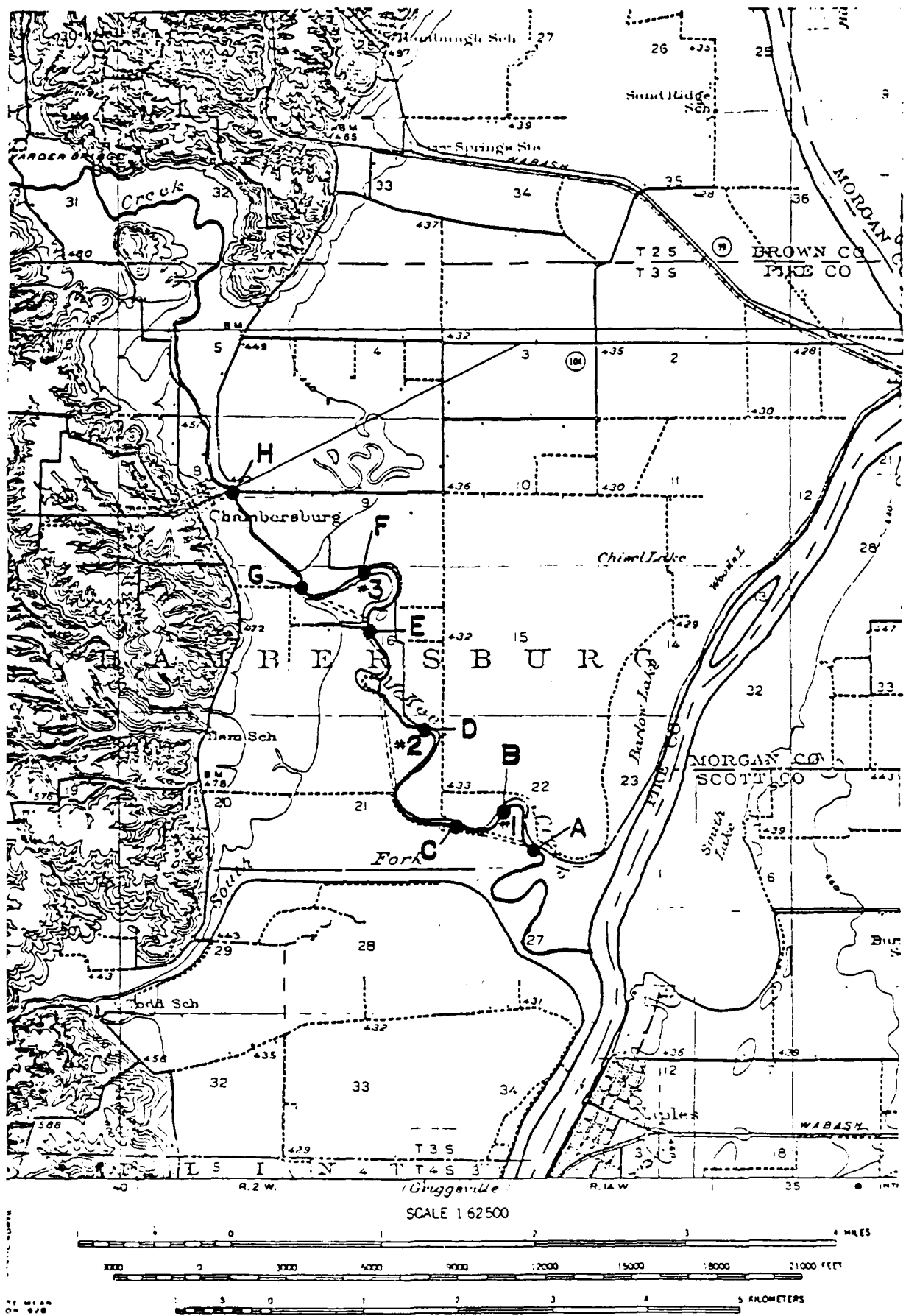


Figure 3. Mist netting locations on McKee Creek, Pike County, Illinois.

Observations were made at each netting locality. Observations provided valuable data on time of initial bat flight, as well as placements of bats in relation to the tree canopy when they first emerge. Observed bats were identified to species whenever possible based on their size and flight activity patterns (Gardner, 1978).

Two float trips were made through the project area. One trip on 5 June, when the creek was near flood stage, and another on 18 July, at normal stage. During these float trips the riparian vegetation was characterized into the following categories:

- I. Few trees on either bank.
- II. Scattered small (less than 16 inches dbh) trees on either bank.
- III. Mature trees (greater than 16 inches dbh) on both banks but not extending past the edge of the creek.
- IV. Mature trees (greater than 16 inches dbh) more than three meters past (overhanging) the creek bank on one or both sides.

Additionally, dominant tree species and width of riparian vegetation were recorded and measured at intervals during the float trips. A basic description of the vegetation combined with the use of aerial photographs, furnished by the Saint Louis District Corps of Engineers, made possible a thorough vegetational analysis.

RESULTS AND DISCUSSION

Bat Survey Results

Mist netting for bats on McKee Creek began on 3 June and was completed by 18 July. On 2 June the creek was still unusually high due to heavy rains in the watershed north of the study area. By 3 June the water level had dropped enough to net at site F, although with great difficulty. A steady fall of the water level barely made possible netting at sites E and A on 4 and 5 June. Continued heavy rains in the area and an ever rising flood stage of the Illinois River following 5 June made further netting on the creek a physical impossibility. The creek returned to normal stage by 14 July, enabling further netting on the creek. The netting nights of 14-18 July were more productive and produced all captures of bats in the study area. No bats were captured at sites A, E and F.

Seven species of bats, representing 49 individuals, were captured on McKee Creek (Table 2). Myotis sodalis was the only federally listed endangered species

Table 2. Bats captured in the McKee Creek Project Area, Pike County, Illinois.

Species	Sex and Age Classes				Capture Sites	Total	% Total Captured
	Female Adult	Female Immature	Male Adult	Male Immature			
<i>Myotis sodalis</i>	3	5	1	5	C,D,G,H	14	29
<i>Myotis lucifugus</i>	4				C,G	4	8
<i>Myotis keeni</i>		1	1		D	2	4
<i>Lasiurus borealis</i>	4	4	8		B,C,D,G,H	16	33
<i>Nycticeius humeralis</i>	2	4	1	1	B,D,G	8	16
<i>Pipistrellus subflavus</i>	2	1			C,D	3	6
<i>Eptesicus fuscus</i>	2				G	2	4
Totals	17	15	11	6		49	100

captured, accounting for 29% of the total captures. No *Myotis grisescens* were captured. Indiana bats captured represented most reproductive stages and age classes. A total of 21% of the *Myotis sodalis* captured (n=3) were adult females and all were post lactating. One adult male *Myotis sodalis* was captured on 15 July, at site D. This male was scrotal and reproductively active. The remaining 71% of *Myotis sodalis* captured were 35.5% immature females (n=5) and 35.5% immature males (n=5). Percentages of total capture for *Lasiurus borealis* (red bat) were 33% (n=16); 16% for *Nycticeius humeralis* (evening bat, n=8); 8% for *Myotis lucifugus* (little brown bat, n=4); 6% for *Pipistrellus subflavus* (Eastern pipistrelle, n=3); and 4% for *Myotis keeni* (Keen's myotis, n=2) and *Eptesicus fuscus* (big brown bat, n=2) (Table 2). Capture data of location, species, sex, age, reproductive condition and time of capture are given in Table 3.

Myotis sodalis was captured at four of the eight netting sites sampled during this study. Netting site H produced eight out of the 14 Indiana bats captured (or 57%). One immature male was captured 80 minutes after sundown. An immature female and male were captured 180 minutes after sundown. The remaining *Myotis sodalis* were not captured until 302 minutes after sundown and after midnight. This data would seem to indicate that netting site H was on the periphery of the foraging range previously reported for the species. Foraging ranges for *Myotis sodalis* have been reported as 0.8 km by Humphrey et. al. (1977) and 1.2 km by Cope et. al.

Table 3. Bat capture data from McKee Creek project area, Pike County, Illinois.

Location	Species	Sex	Age	Reproductive Condition	Capture Time (hrs.)
Site A 5 June	No bats captured				
Site B 18 July	Nycticeius humeralis	M	Imm	scrotal-active	2130
	Lasiurus borealis	M	A	scrotal-active	2200
	Nycticeius humeralis	F	A	post lact.	2145
	Nycticeius humeralis	F	Imm		2200
Site C 16 July	Myotis sodalis	M	Imm		2200
	Lasiurus borealis	F	Imm		2230
	Myotis lucifugus	F	A	post lact.	2245
	Lasiurus borealis	M	A	scrotal-active	2245
	Pipistrellus subflavus	F	Imm		2400
	Myotis lucifugus	F	A	post lact.	2400
	Myotis sodalis	F	Imm		2400
	Myotis sodalis	M	Imm		2400
	Myotis lucifugus	F	A	post lact.	2400
	Lasiurus borealis	F	A	post lact.	2413
	Lasiurus borealis	M	A	scrotal-active	2440
Site D 15 July	Pipistrellus subflavus	F	A	lact.	2049
	Lasiurus borealis	M	A	scrotal-active	2103
	Lasiurus borealis	M	A	scrotal-active	2103
	Lasiurus borealis	M	A	scrotal-active	2115
	Myotis keeni	F	Imm		2145
	Nycticeius humeralis	F	Imm		2200
	Lasiurus borealis	F	A	post lact.	2200
	Myotis keeni	M	A	scrotal	2200
	Myotis sodalis	F	A		2315
	Lasiurus borealis	F	A	post lact.	2315
	Pipistrellus subflavus	F	A	lact.	2315
	Myotis sodalis	M	A	scrotal	2345
	Nycticeius humeralis	F	A		2345
Site E 4 June	No bats captured				
Site F 3 June	No bats captured				
Site G 17 July	Lasiurus borealis	F	Imm		2105
	Nycticeius humeralis	F	Imm		2105
	Lasiurus borealis	F	Imm		2130
	Eptesicus fuscus	F	A	lact.	2200
	Eptesicus fuscus	F	A	lact.	2200
	Nycticeius humeralis	F	Imm		2230

Table 3. Continued.

Location	Species	Sex	Age	Reproductive Condition	Capture Time (hrs.)
Site G (cont.)	<i>Nycticeius humeralis</i>	M	A	scrotal-active	2230
	<i>Myotis sodalis</i>	F	A	post lact.	2245
	<i>Myotis lucifugus</i>	F	A	post lact.	2245
	<i>Lasiurus borealis</i>	F	A	post lact.	2245
Site H 14 July	<i>Myotis sodalis</i>	M	Imm		2115
	<i>Lasiurus borealis</i>	M	A	scrotal-active	2125
	<i>Myotis sodalis</i>	M	Imm		2215
	<i>Myotis sodalis</i>	F	Imm		2215
	<i>Lasiurus borealis</i>	M	A	scrotal-active	2225
	<i>Myotis sodalis</i>	M	Imm		2225
	<i>Lasiurus borealis</i>	F	Imm		2300
	<i>Myotis sodalis</i>	F	Imm		2337
	<i>Myotis sodalis</i>	F	Imm		2400
	<i>Myotis sodalis</i>	F	A	post lact.	2400
	<i>Myotis sodalis</i>	F	Imm		2430

(1978). *Myotis sodalis* have been found to spend the first half hour after dark foraging in the vicinity of their diurnal roost (Humphrey et. al., 1977; and Cope et. al., 1978). An attempt was made to determine the locality of the diurnal roost by mist netting at site G, only 1.0 km downstream from site H. Site G produced only a single adult female, post-lactating *Myotis sodalis*, although nine other bats of four species were captured. These data seem to indicate the roost location was somewhere upstream from site H, out of the project area. *Myotis sodalis* was also captured at sites C and D. Two immature males and one immature female (captured at 2200 and 2400 hrs. respectively) were netted at site C, and an adult male and female were netted at site D (both were captured at 2315).

Available literature seems to indicate that parturition occurs in *Myotis sodalis* by late June and young bats are volant by mid July (Barbour and Davis, 1969; Humphrey et. al., 1977; and Cope et. al., 1978). This would explain the dispersal of volant immature *Myotis sodalis* captured on McKee Creek during this study. Although six large dead trees were found and examined, no diurnal roost or evidence thereof was discovered. The location of dead trees and old buildings examined during this study is shown in Figure 4.



Figure 4. The location of dead trees and old buildings found in the McKee Creek study area as they relate to the netting sites.

Lasiurus borealis was captured in five sites throughout the study area (Table 2), and was the most commonly captured bat. Adult male red bats were captured at four of the five successful netting localities (n=8), all were reproductively active. Four adult females (all post-lactating) and four immature females were captured. Lasiurus borealis, a nomadic tree-dweller, was observed in several netting sites to be the first bat to emerge in the evening. On nearly every occasion, red bats were one of the first bats captured.

Nycticeius humeralis was the third most commonly captured bat, accounting for 16% of the total capture (Table 2). On 18 July a post-lactating adult female, an immature male and an immature female were captured at site B. A post-lactating adult female and an immature female were captured at site D. The only scrotal adult male (reproductively active) was captured simultaneously with an immature female at 2230 hrs. Reproductive condition of the female was not determined.

Only adult female, post-lactating Myotis lucifugus were captured in the McKee Creek project area. Three females were captured at site C and only one at site G. Myotis lucifugus establish maternity colonies in the attics of old buildings and similar warm, dark places (Barbour and Davis, 1969). Several old barns and houses were examined in close proximity to the study area, however, no colonies of any bat species were discovered. One barn, not shown in Figure 4, had been used by an unidentified species of bat in recent years. According to the owner, the bats were beneath the old wooden shingles on the east side of the barn, behind the loft doors which were nailed open. When the owner removed the old shingles to paint the barn, he was dismayed to find that paint would not stick to the area where bats had been roosting. The bats no longer use the barn.

Pipistrellus subflavus was only captured at site C and D, accounting for 6% of the total capture (Table 2). An adult female, actively lactating, was captured at site D only 14 minutes after sundown. She was observed to emerge approximately five minutes after sundown and began foraging at treetop height in a small circular area over the creek shortly before she was captured. This type of behavior has been previously noted for Pipistrellus subflavus (Barbour and Davis, 1969). An immature female Pipistrellus subflavus was captured at site C at midnight.

Myotis keeni were only captured at site D. A scrotal adult male was captured at 2200 hrs. and an immature female was captured at 2145 hrs. Myotis keeni is a

northern species, commonly encountered in mines and caves (Barbour and Davis, 1969). It is fairly commonly encountered in the Ozark Cave Region of Missouri, however, LaVal et. al. (1980), considers it a rare species for the state. Although essentially nothing is known of reproduction in this species, a nursery colony was found beneath the bark of a dead elm tree in Indiana on 8 July (Mumford and Cope, 1964). Myotis keeni is considered to be a common bat in Indiana and Illinois (Barbour and Davis, 1969). The captures of only 2 Myotis keeni in a single netting site indicate that it is not a common species of McKee Creek.

Eptesicus fuscus were captured in a single netting locality, site G. Two adult females, both actively lactating, were captured simultaneously at 2230 hrs. Both bats were caught 4 m high over the creek in the middle of the net only 5 m apart. Both bats were headed upstream. A nursery colony was discovered on 6 June in the attic of the historic Old East School building in Pittsfield, Pike County, Illinois. The school is over 50 km southwest of McKee Creek. Several individuals in the large colony (unknown number) were subsequently shot. Formaldehyde was sprayed throughout the attic by local health officials in an attempt to discourage the bats from returning.

Vegetational Analysis and Stream Characterization

McKee Creek study area is located in the Illinois River Valley, a flattened area subjected to flooding. The tree species that are found there are lowland species which are adapted to wetland habitat. The single most dominant lowland species found in the project area was silver maple (Acer saccharinum), which is well adapted to wet soils. Mature silver maples of well over 92 cm dbh was found in almost every segment of the creek. Cottonwood (Populus deltoides) also dominated the bottomland woods on each side of the stream. Very thick stands of immature cottonwood (6 cm dbh and 20 m high) and black willow (Salix nigra) were found invading sandy beach areas along the creek. Large sycamore (Platanus occidentalis) were found throughout the study area, but more sparsely than silver maple, cottonwood and black willow, but were confined to the immediate creek banks. Other lowland species found in the area included bur oak (Quercus macrocarpa), box elder (Acer negundo), slippery elm (Ulmus rubra), green ash (Fraxinus pennsylvanica) and various oaks (Quercus sp.). The understory is composed of hackberry (Celtis occidentalis), red mulberry (Morus rubra), sassafras (Sassafras albidum) and black locust (Robinia pseudoacacia). Trees

in some lower sections of the creek were completely covered by wild grape (*Vitis* sp.). The areas between the levee and riparian vegetation and the levees were covered by grasses and sedges. Areas within some levees extending to the creek bank were rowcrops. Classification of the riparian habitat in the McKee Creek study area is given in Figure 5.

The riparian habitat surrounding McKee Creek varied considerably in size (Figure 5). The largest areas of riparian forest were found in three locations along the creek. One area, segment 0.8 to 1.6 km is found upstream from the first proposed cutoff. This area of approximately 17.7 ha is covered by the dominant tree species listed in Table 4. Netting sites F and G were located in this area. Two dead ex-foliated trees were also found in this segment, however, both were found not to contain colonies of bats.

The largest area of 439 ha is found in the 3.8 to 4.2 km segment of creek. This low, swampy area is dominated by black willow along the immediate west bank of the creek. Other species found further inland include cottonwood, silver maple, slippery elm and a few sycamore. A 0.37 ha pond is found in the middle of the area. Other areas of the creek bank are almost void of trees, or have only few trees. In these areas rowcrops of corn and beans are cultivated right up to the creek banks.

McKee Creek was studied on two occasions. On 3, 4 and 5 June the creek had dropped slightly from near flood stage. The width on these dates averaged 13.1 m, ranging from 9.2 m in the upper sections to greater than 20 m in the lower portions. The depth averaged 2.3 m (ranging from 1 m to over 4 m). It was not until the week of 14 July that McKee Creek had returned to normal stages. The average width during this week of study was 11.5 m, ranging from 9 m in the upper stretches to 16 m in the lower sections. The depth had dropped drastically, averaging 0.7 m. The depth ranged from 10 cm in sandy bottom riffle areas to 1.5 m in pools. The depth and width of McKee Creek in normal stages made almost every portion of the study area accessible to netting for bats. For this reason, descriptive characteristics of the creek were limited to normal stages of the creek. Regardless of the creek stage, steep mud banks lined the creek on both sides. The bottom type was primarily mud, however, there was small areas of sand and coarse gravel in the upper sections.



Figure 5. Orthophotoquad of McKee Creek, Pike County, Illinois, representing the vegetational categorization of the creek segments.

Table 4. Riparian vegetational analysis and characteristics of McKee Creek, Pike County, Illinois. The first two tree species listed under each creek segment are the most dominant in that segment.

Segment Length (km)	Dominant Species	Vegetational Category	Width of Vegetation (m)		Width (m)	Creek Characteristics		
			east	west		Bottom Type	Frequency Riffle	Pool
0.0-0.3	Black Willow Cottonwood Silver Maple Sycamore Box Elder	IV	54	24	9	Mud		cont.
0.3-0.8	Silver Maple Cottonwood Black Willow Box Elder Hackberry	II	24-8	10-0	9	Mud		cont.
0.8-1.6	Silver Maple Cottonwood Box Elder Black Willow Sycamore Bur Oak	IV	265	22	9	Sand-Mud	Intermittent	cont.
1.6-2.4	Silver Maple Sycamore Cottonwood Black Willow Slippery Elm Box Elder	IV	27	91	10	Mud		cont.
2.4-2.7	Black Willow Silver Maple Cottonwood	II	11	15	11	Mud		cont.
2.7-3.0	Silver Maple Cottonwood Black Willow Box Elder	IV	65	20	11	Mud		cont.
3.0-3.3	Silver Maple Cottonwood Black Willow Box Elder	III	182	275	12	Mud		cont.

Table 4. Continued.

Segment Length (km)	Dominant Species	Vegetational Category	Width of Vegetation (m)		Width (m)	Bottom Type	Creek Characteristics Frequency	
			east	west			Riffle	Pool
3.3-3.8	Silver Maple Cottonwood Black Willow Box Elder Sycamore	IV	25	23-0	11	Sand	Intermit- tent	cont.
3.8-4.2	Black Willows Cottonwoods Silver Maple Slippery Elm Sycamore	III	10	800	11	Mud		cont.
4.2-4.7	Silver Maple Cottonwood Sycamore Slippery Elm Black Willow	IV	142	5	10	Mud		cont.
4.7-5.5	Silver Maple Black Willow Sycamore Cottonwood	I	15-0	0	15	Mud		cont.
5.5-6.0	Silver Maple Black Willow Cottonwood	II	70	0	16	Mud		cont.
6.0-10.6	Silver Maple Cottonwood Black Willow Sycamore	IV	continuous		16	Mud		cont.

Discussion

Five netting sites were located in habitat category IV (Table 5). The seven species captured within these netting localities are follow: Myotis sodalis, Myotis lucifugus, Myotis keeni, Lasiurus borealis, Nycticeius humeralis, Pipistrellus subflavus and Eptesicus fuscus. Only sites D and F had full canopied areas. Two species of bats were not caught at site D, Myotis lucifugus and Eptesicus fuscus. No bats were captured at site F, probably due to the creek being in flood stage.

Table 5. Net site data on McKee Creek, McGee Creek Drainage and Levee District, Pike County, Illinois.

Net Site (km mark)	Vegetational Category	Width of Vegetation		Canopy	Width (m)	Creek Characteristics		
		east	west			Bottom Type	Riffle	Pool
A 5.95	II	29	6	none	16	Mud		X
B 5.12	I	20	8	full	15	Mud		X
C 4.6	IV	95	5	partial	10	Mud		X
D 3.33	IV	15	37	full	11	Sand	X	
E 2.58	II	15	14	none	11	Mud		X
F 1.6	IV	29	62	full	10	Mud		X
G 1.0	IV	309	12	none	9	Sand-Mud	X	
H 0.05	IV	0	20	none	9	Mud		X

making netting extremely less productive. Sites G and F were classified under category IV, however, there were no canopied areas near the netting sites. Myotis sodalis, Myotis lucifugus, Lasiurus borealis, Nycticeius humeralis and Eptesicus fuscus were captured at site G, Myotis sodalis and Lasiurus borealis were captured at site H. These data seem to indicate that bats do not necessarily prefer canopied areas of the creek, nor are they more difficult to capture in non-canopied areas. Site B, an area of few trees on either bank, but with a single canopy, still yielded captures of Lasiurus borealis and Nycticeius humeralis.

Myotis sodalis were captured at sites C, D, G and H (Table 2). All of these areas were classified as category IV. Myotis sodalis and other species were observed to emerge from 5 to 20 minutes after sundown and to begin foraging at treetop height. As it became darker the bats dropped down to between 8 m and treetop height. At net site C and H, bats were observed feeding over the creek and edge of the rowcrop side of the riparian vegetation. Myotis sodalis were the first bats captured at these sites,

2200 hrs. and 2115 hrs. (57 minutes and 21 minutes after sundown). Foraging Myotis sodalis have been reported previously in air spaces from 2 to 30 m high near the foliage of riparian and floodplain trees (Humphrey et. al., 1977). Indiana bats were captured predominately in the middle of the creek (57% of captures). At site H, where 57% of the total number of Myotis sodalis were captured, the first three bats were captured heading downstream (Table 6). This seems to further indicate that the colony was located upstream from site H, and bats were captured during dispersal downstream, away from the colony area during their nightly foraging activities.

Summer habitat characteristic of that found on McKee Creek, Pike County, Illinois, represents important habitat for Myotis sodalis. Indiana bats were captured while foraging among the riparian vegetation at four of the eight sites netted during this study. A nursery tree roost undoubtedly exists somewhere in the upper portions of McKee Creek. Data collected at site H on 14 July seems to indicate the colony is somewhere within 0.8 to 1.2 km upstream of the highway 104 bridge at Chambersburg. This portion of McKee Creek is north of the project area and is therefore not threatened by any channelization activities. It was apparent from the vegetational analysis that a considerable amount of riparian habitat is found throughout the lower 10.6 km of McKee Creek. This habitat supports reproducing populations of Myotis sodalis and other bat fauna.

Table 6. Direction and positioning data for Myotis sodalis captured on McKee Creek, Pike County, Illinois.

Net Site	Direction Headed	Height over Stream (m)	Side of Stream
C	downstream	6	east
	upstream	4.5	middle
	upstream	4.5	middle
D	downstream	6.4	middle
	downstream	6.4	middle
G	downstream	3	east
H	downstream	3	east
	downstream	4	middle
	downstream	4	middle
	upstream	4.5	middle
	downstream	5	east
	downstream	6.4	middle
	upstream	6.4	west
	upstream	2	west

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